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OFFICE OF CHEMICAL
SAFETY
AND POLLUTION
PREVENTION

MEMORANDUM

SUBJECT: Review of Emergency Exemption Request from Texas for the Use of Sulfoxaflor to Control the Asian Citrus Psyllid on Mature Citrus Groves (17TX04; DP#439221)

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Summary
The Texas Department of Agriculture (TDA) is applying for a specific emergency exemption to use sulfoxaflor for control of the Asian citrus psyllid (ACP), *(Diaphorina citri)* to manage transmission of huanglongbing (HLB) (*Candidatus* Liberbacter *asiaticus*), also known as citrus greening, in mature commercial citrus groves. The loss of the Section 3 registration of sulfoxaflor constitutes a non-routine situation, however, since the registration was vacated BEAD has concluded that ACP has not caused immediate damage to the citrus crop. BEAD agrees HLB is a significant economic threat to Texas citrus, however, with prophylactic insecticide programs in place to control ACP the losses in Texas are unlikely to be as estimated.

BEAD concludes that the TDA application does not meet the criteria for an emergency condition.

Purpose of a Section 18 Review

The two primary purposes of a BEAD review are:

1. To determine if there is an urgent and non-routine situation that requires the use of a pesticide that is unregistered for the site requested, and
2. To determine if the condition will result in a significant economic loss (SEL) if growers are limited to the best available pest control methods.

"Urgent and non-routine" means that the problem is out of the ordinary with the potential to cause immediate damage. The information submitted to substantiate "urgent and non-routine" must identify pest problems that cannot wait for the usual registration process under FIFRA Section 3. "Significant economic loss" (SEL) is meant to identify problems that result in economic losses to the grower severe enough to warrant an exemption from the Section 3 registration process.

Past Requests

TDA was granted a specific emergency exemption in 2016 for use of up to two soil drench applications of clothianidin to manage HLB transmission for non-bearing, immature commercial citrus trees. Immature citrus trees are described as replants less than one-year-old (<1 to 5 feet tall), immature trees one- to two-year-old (3-5 feet tall), or three to five-year-old trees (5-9 feet tall). Clothianidin was requested after sulfoxaflor was canceled in 2015, however, the use pattern for these two chemicals is different.

Current Request

The current request is for up to four applications of 0.043 – 0.09 pounds (lbs) active ingredient (a.i.) per acre of sulfoxaflor on 27,000 acres of mature commercial citrus groves to target ACP adults. No more than 0.266 lb a.i./acre of sulfoxaflor can be applied in a given year. Applications would be made by ground airblast sprayers or aerial crop sprayer planes. The use of sulfoxaflor would be prohibited from three days prior to bloom until petal fall. The Section 18 emergency exemption request would apply to the following Texas counties: Brooks, Cameron, Hidalgo, Jim Hogg, Kenedy, Starr, Willacy, and Zapata.

Pest Biology and Damage

ACP is the most serious pest of citrus worldwide due to its capacity to vector HLB (Grafton-Cardwell et al. 2013). ACP damages citrus directly by feeding on new leaf growth (i.e. flush) but the primary economic concern of ACP is vectoring citrus greening (HLB). Psyllids obtain the bacterial HLB disease from feeding on infected trees and can transfer the disease to healthy trees. ACP predominantly feed and reproduce on young tender leaves, hence young trees that produce multiple flushes throughout the year are at greater risk of HLB infection than are older trees with fewer growth flushes (Grafton-Cardwell 2013). HLB negatively affects yield, fruit size and quality, as well as tree mortality. HLB can kill a citrus tree within five years, meanwhile, yield will decrease and the infected tree will provide inoculum to spread the disease through the citrus grove (UC IPM 2016). There is no known cure for HLB and disease management is limited to aggressive preventative insecticide programs and infected tree removal. Replacement trees do not produce at full capacity for several years and remain at risk to infection. Because infection with HLB is the primary concern driving control of ACP, a very low tolerance for ACP infestation exists. Current psyllid management recommendations include a year round program of broad-spectrum insecticides to target egg-laying adults as well as systemic pesticides to prevent feeding of psyllid nymphs which more effectively transmit disease. TDA has requested sulfoxaflor for use primarily as an adulticide and will be compared to other adulticides below.

Analysis of the Pest Problem

In the following section, BEAD considers whether the loss of sulfoxaflor in 2015 has impacted TDA's capacity to control ACP and therefore HLB. Notably, sulfoxaflor was only available from May 2013 – November 2015 before the registration was vacated. During this period, annually there was an average of 15,000 total acres treated with sulfoxaflor in solely grapefruit groves in Texas (MRD 2013-2015). Texas has 18,000 acres of grapefruit in production (USDA 2011-2015). Therefore, adoption of sulfoxaflor for grapefruit was high while it was registered in the state. Furthermore, TDA provided some information that sulfoxaflor provides statistically equivalent efficacy to spirotetramat and spinetoram (TDA 2017). However, Texas is requesting sulfoxaflor as an adulticide for ACP whereas spirotetramat and spinetoram are typically used for nymph control (TDA 2017).

TDA has been maintaining a preventative area-wide pesticide program for HLB since 2010 where growers spray a minimum of eight times per year for ACP control (TDA 2017). HLB was first documented in Texas in January 2012 and disease presence has spread to 10% (4,700 acres) of commercial citrus in the state (TDA 2017). TDA claims Florida is a reasonable case study for pest damage potential in Texas. In Florida, citrus growers estimate approximately 90% of acreage is infected with HLB with a corresponding to 41% average yield loss (Singerman and Useche 2016). TDA claims that without sulfoxaflor the state is without a sufficient number of registered pest controls to control ACP and maintain pest susceptibility (TDA 2017) and thus will likely face similar losses as Florida.

Registered Alternative Controls

Insecticides for control of ACP on citrus (oranges, grapefruit, and lemons) include broad-spectrum chemistries such as pyrethroids (zeta-cypermethrin, fenpropathrin, etc.), organophosphates (dimethoate, malathion, chlorpyrifos, phosmet, etc.), as well as newer active ingredients (flupyradifurone, spinetoram, etc.) (MRD 2011-2015; Rogers et al. 2016; Table 1). BEAD's proprietary market research data (MRD) source does not delineate nymph versus adult ACP control options but top active ingredients in Texas include: imidacloprid, abamectin, and sulfoxaflor (MRD 2011-2015) indicating that sulfoxaflor was an important chemistry when available. Extension recommendations from Florida indicate the preferred registered control options for ACP below (Table 1) as well as an example efficacious seasonal program (Table 2).

Table 1. Recommended Chemical Controls for the Asian Citrus Psyllid

Active Ingredient	IRAC MOA[1]
Abamectin	6, avermectin
Beta-cyfluthrin	3A, pyrethroid
Carbaryl	1A, carbamate
Chlorpyrifos	1B, organophosphate
Clothianidin**	4A, neonicotinoid
Cyantraniliprole	28, diamide
Diflubenzuron*	15, benzoylurea
Dimethoate	1B, organophosphate
Fenpropathrin	3A, pyrethroid
Fenpyroximate*	21A, METI inhibitor
Flupyradifurone	4D, butenolide
Imidacloprid	4A, neonicotinoid
Phosmet	1B, organophosphate
Spinetoram	5, spinosyn
Spirotetramat*	23, acetyl CoA carboxylase inhibitor
Thiamethoxam	4A, neonicotinoid
Tolfenpyrad	21A, METI inhibitor
Zeta-cypermethrin	3A, pyrethroid

1 (IRAC 2017)
* controls ACP nymphs only
** registered only for non-bearing trees in Texas, primarily for nymph control
Modified from Rogers et al. (2016); note this is not an exhaustive list of alternatives

TDA claims that sulfoxaflor is needed to prevent resistance developing in ACP because relatively few modes of action are available rather than a claim of immediate yield loss (TDA 2017). BEAD has identified 11 mode of action groups available for ACP control (Table 1). BEAD recognizes that susceptibility of ACP to neonicotinoids, pyrethroids, and organophosphates has reportedly declined (Grafton-Cardwell et al. 2013), however, recent bioassays have shown that susceptibility has returned to baseline levels in subsequent years (FFVA, agency comm. 2017). TDA did not provide any evidence of decreased susceptibility in local ACP populations. TDA expressed concern that organophosphates and pyrethroids can cause secondary pest outbreaks but provides no information of economic damage related to these events. While organophosphates and pyrethroids may not be ideal control options, that is not enough to disqualify their use as alternatives for the purpose of a Section 18 emergency exemption. Furthermore, Qureshi et al. (2014) found that the following existing chemistries, tolfenpyrad, cyantraniliprole, and flupyradifurone were more efficacious and longer lasting than sulfoxaflor. BEAD concludes that Texas has numerous, efficacious modes of action to control ACP available and the loss of sulfoxaflor has not resulted in any immediate yield loss despite its importance to Texas citrus during its registration period.

Table 2. Example Asian Citrus Psyllid seasonal insecticide program

	Number of sprays per year			MoA
	Four	Five	Seven	
Jan	Pyrethroid	Pyrethroid	Pyrethroid	7
Feb	Spirotetramat*	Spirotetramat*	Spirotetramat*	23
Mar			Fenpyroximate*	15
Apr	Oil	Oil	Oil	
May	Spinetoram	Spinetoram	Spinetoram	5
Jun	Spinetoram	Spinetoram	(Abamectin, Thiamethoxam)*	(6, 4) 5
Jul	Oil	Oil	Oil	
Aug				
Sep		Diflubenzuron*	Diflubenzuron*	21
Oct				
Nov -Dec	Organophosphate	Organophosphate	Organophosphate	1B

Parentheses indicate single product
* primarily for nymph control
Modified from Qureshi et al. 2014

BEAD identified one difference between active registrations in Florida and Texas for ACP control and explored whether this difference in registrations between the two states could result in a gap in Texas's seasonal program that is not experienced by states with a corresponding pest emergency. TDA (2017) claims 25,000 acres of mature citrus are without control options for ACP because, unlike in Florida, clothianidin is not registered for use on mature trees. BEAD acknowledges that ACP control is a year-long undertaking to prevent transmission of HLB but it is unclear where a gap in the seasonal program may present itself with the existing universe of alternatives. Table 2 outlines a multi-pest seasonal insecticide program with the objective of using efficacious products with variable modes of action recommended to Florida citrus growers (Qureshi et al. 2014). Each active ingredient outlined in Table 2 was tested for comparatively efficacy against ACP and results in upwards of 90% of ACP population control (Qureshi et al. 2014). Table 2 explores a seven spray per year program whereas growers in Texas spray at least eight if not up to twelve times per season (TDA 2017). Consulting table 1 demonstrates that numerous MoAs would remain available on top of those recommended by Qureshi et al. 2014 in Table 2. Note, there is no best spray program nor does the Agency endorse the following program, the purpose of Table 2 is to emphasize that adequate ACP control can be provided without exhausting active registrations and leaves room for a more intensive program if necessary.

Significance of the Pest Problem

For a typical Section 18 Emergency Exemption Analysis, BEAD determines the severity of a pest problem by estimating the loss resulting from the non-routine and urgent situation and comparing it to measures of grower income or revenue on a per-acre basis. The analysis is conducted through three tiers where the initial tiers are designed to make a determination of significant economic loss with limited data. Tier 1 considers only yield loss. For Tier 1, a yield loss of 20% or more is considered to be significant. For a Tier 2 analysis, a loss amounting to 20% or more of gross revenue is considered to be significant. For a Tier 3 analysis, a loss amounting to 50% or more of net operating revenue (gross revenue minus operating costs) is considered to be significant. A review of cost and return studies by USDA Economic Research Service in the early 2000s indicated that net operating revenue for most crops is typically between 20 and 40 percent of gross revenue although some crops are outside these bounds. Thus, a loss of 20 percent in yield or gross revenue would generally equate to a loss of 50 to 100 percent of net operating revenue.

In this case, SEL can only be preemptively calculated based on case studies in other states where HLB has dominated citrus production. TDA's request for the use of sulfoxaflor is as a prophylactic treatment to prevent disease spread. TDA proposes that losses in Florida serve as a case study for Texas. TDA (2017) states that economic losses in Florida have exceeded 50%. Recent surveys have found that Florida citrus growers estimate approximately 90% of acreage is infected with HLB corresponding to 41% average yield loss (Singerman and Useche 2016). The impact estimate is not as straightforward as yield loss alone. In addition to the yield loss, farmers are impacted by reduced quality of fruit and subsequent economic loss. Harvested fruit from infested trees are smaller, with more acid and less sugar, and the reduced quality decreases the value of the harvested crop (Gottwald et al. 2007). Furthermore, increased pesticide output, scouting for HLB, and ultimately replacing infected trees adds to the financial burden. Although these results are based on the impact in Florida, they are plausible forecasts for Texas if HLB cannot be controlled. However, this situation in Texas does not directly correlate because TDA had preventative IPM practices in place in 2010 before disease outbreak in 2012. Ultimately, TDA did not provide information that substantiated yield loss on a per acre basis or disease occurrence occurring following the registration of sulfoxaflor being vacated.

Conclusions

BEAD concludes that the loss of sulfoxaflor has not compromised the ability of Texas citrus growers to control ACP. While the loss of sulfoxaflor is non-routine, ACP infestation is not causing urgent and immediate loss in Texas with the use of currently registered insecticides. While HLB presents an existential threat to the citrus industry, loss of sulfoxaflor specifically has not appeared to cause any additional losses since the pesticide was canceled.

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